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EXAMINER	
TIMORY, KABIR A	
ART UNIT	**PAPER NUMBER**
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/780,180	Applicant(s) WENDT ET AL.
	Examiner Kabir A. Timory	Art Unit 2611

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 12 July 2007.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-19 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-4, 10-12, 15-19 is/are rejected.

7)☒ Claim(s) 5-9,13 and 14 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. This office action is in response to the amendment filed on July 12, 2007. Claims 1-19 are pending in this application and have been considered below.

2. The objection to the abstract is corrected by the amendment; therefore, the objection is withdrawn.

3. The objection to the claim 15 is corrected by the amendment; therefore, the objection is withdrawn.

4. The rejection under 35 U.S.C 101 to the claims 16-19 was directed to non-statutory subject matter is corrected by the amendment; therefore, the rejection is withdrawn.

5. Applicant's arguments with respect to claims 1, 10, 15, 16, 18, and 19 have been considered but are moot in view of new ground(s) of rejection because of the amendment.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

7. Claims 1-3, 10, 11, and 15 are rejected under 35 U.S.C. 102(e) as being anticipated by Siala et al. (US Patent Number 6,674,740).

Regarding claim 1:

As shown in figures 1-5, Siala et al. discloses a signal processing apparatus operable to represent the effects on a received signal of a radio communications channel having L paths, each path having an average attenuation and a pre-determined respective delay, wherein the received signal includes a combination of correlated components determined from an effect of pulse shaping filters on the received signal, each correlated component having a correlation coefficient representing a correlation of the received signal component with respect to each of the other components, the signal processing apparatus comprising:

- a plurality of signal simulators (12_0 – 12_L-1 in figure 2), each simulator generating a signal component value proportional to a complex zero mean gaussian random

variable having a pre determined variance (column 3, lines 52-67, column 4, lines 1-32), and

- a summer (18 in figure 2) operable to sum the signal component values produced from each signal simulator, to form a representation of the signal received via the radio communications channel, wherein the variance of each of the signal component values produced by each of said plurality of signal simulators is pre-determined by calculating the eigen values of a matrix formed from the correlation coefficients and from a channel correlation matrix which includes the average attenuation of each of the L paths (column 3, lines 52-67, column 4, lines 1-32).

Regarding claim 2:

Siala et al. further discloses wherein the number of signal simulators is less than the number of paths L of the radio communications channel, the number of signal simulators being determined from the number of eigen values above a pre-determined threshold, each eigen value above the threshold forming the pre-determined variance for a corresponding signal simulator (column 3, lines 52-67, column 4, lines 1-32, column 7, lines 37-45).

Regarding claim 3:

Siala et al. further discloses wherein

- the correlated components from which the received signal is formed are representative of components formed from respective correlators of a rake receiver (column 8, lines 16-27),
- the received signal being a spread spectrum signal (abstract),

- the correlation coefficients representing a correlation of the output signal of each correlator with respect to the output of the other correlators (figure1, column 1, lines 51-65)

Regarding claim 10:

As shown in figures 1-5, Siala et al. discloses a method of representing the effects of a radio communications channel having L paths on a received signal, each path having an average attenuation and a pre-determined respective delay, wherein the received signal includes a combination of correlated components determined from an effect of pulse shaping filters on the received signal, each correlated component having a correlation coefficient representing a correlation of the received signal component with respect to each of the other components, the method comprising

- generating a plurality of complex zero mean Gaussian random variables each having a pre-determined valiance (column 3, lines 52-67, column 4, lines 1-32), and
- summing (18 in figure 2) the variables, to form a representation of the signal received via the radio communications channel wherein pre-determined variance of each variable is calculated from the Eigen values of a matrix formed from the correlation coefficients and from a channel correlation matrix which includes the average attenuation of each of the L paths (column 3, lines 52-67, column 4, lines 1-32).

Regarding claim 11:

Siala et al. further discloses wherein the number of complex zero mean Gaussian random variables is less than the number of paths L of the radio communications

channel the number of variables being determined from the number of Eigen values which are above a pre-determined threshold, each Eigen value above the threshold forming the variance for a corresponding one of the Gaussian random variables (column 3, lines 52-67, column 4, lines 1-32, column 7, lines 37-45).

Regarding claim 15:

As shown in figures 1-5, Siala et al. discloses a method of simulating a radio communications channel, comprising:

- identifying a number of paths L via which a signal is received from the radio communications channel (abstract),
- determining an average attenuation and a pre-determined delay with respect to a first of the paths of a communicated radio signal for each of the paths (figure 3),
- determining a plurality of correlation coefficients from an effect of pulse shaping filters on the received signal (16_0 – 16_L-1 in figure 2, abstract, column 8, lines 16-27),
- forming a matrix from the correlation coefficients introduced by the pulse shaping filters and from a channel correlation matrix which includes the average attenuation of each of the L paths (column 3, lines 52-67, column 4, lines 1-32),
- for each of the paths of the radio channel, calculating a variance of a complex zero mean complex Gaussian process from the Eigen values of the formed matrix (column 3, lines 52-67, column 4, lines 1-32),

- generating, for each path, a signal component value proportional to the complex zero mean Gaussian random variable having the calculated variance (column 3, lines 52-67, column 4, lines 1-32), and
- summing (18 in figure 2) the signal component values produced for each path, to form a representation of a signal received via the radio communications channel (column 3, lines 52-67, column 4, lines 1-32).

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. Claims 4 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Siala et al. (US Patent Number 6,674,740) in view of Chang et al. (US Pub. Number 2003/0072354).

Regarding claim 4:

Siala et al. further discloses all of the subject matter as described above except for specifically teaching wherein the signal component value produced by each signal

simulator is formed from a squared magnitude of the zero mean complex Gaussian random variable.

However, Chang et al. in the same field of endeavor teaches wherein the signal component value produced by each signal simulator is formed from a squared magnitude of the zero mean complex Gaussian random variable (figure 2, paragraph 0067, lines 1-7 and paragraph 0083, lines 1-7).

One of ordinary skill in the art would have clearly recognized that a squared magnitude is a statistical measure of the magnitude of a varying quantity. It can be calculated for a series of discrete values or for a continuously varying function.

In order to calculate the zero mean complex Gaussian random variable, it would have been obvious to one of ordinary skilled in the art to use squared magnitude functions as taught by Chang et al. in the timing estimation of direct sequence spread spectrum communications systems over frequency-selective, slowly fading channels.

Using squared magnitude functions in advantageous because we can calculate a series of discrete values or for a continuously varying function such as zero mean complex Gaussian random variable.

Regarding claim 12:

Siala et al. further discloses all of the subject matter as described above except for specifically teaching forming a squared magnitude of the zero mean complex Gaussian variable, before summing to form the representation of the received signal.

However, Chang et al. in the same field of endeavor teaches forming a squared magnitude of the zero mean complex Gaussian variable, before summing to form the

representation of the received signal (figure 2, paragraph 0067, lines 1-7 and paragraph 0083, lines 1-7).

One of ordinary skill in the art would have clearly recognized that a squared magnitude is a statistical measure of the magnitude of a varying quantity. It can be calculated for a series of discrete values or for a continuously varying function.

In order to calculate the zero mean complex Gaussian random variable, it would have been obvious to one of ordinary skilled in the art to use squared magnitude functions as taught by Chang et al. in the timing estimation of direct sequence spread spectrum communications systems over frequency-selective, slowly fading channels.

Using squared magnitude functions in advantageous because we can calculate a series of discrete values or for a continuously varying function such as zero mean complex Gaussian random variable.

10. Claims 16-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Siala et al. (US Patent Number 6,674,740) in view of Langberg et al. (US Patent Number 5,852,630).

Regarding Claims 16-19:

Siala et al. discloses all of the subject matter as described above except for the method written by a software program embodied in a computer-readable medium.

However, Langberg et al. teaches that the method and apparatus for a transceiver warm start activation procedure with precoding can be implemented in software stored in a computer-readable medium. The computer-readable medium is an electronic, magnetic, optical, or other physical device or means that can be contain or store a computer program for use by or in connection with a computer-related system or method (column 3, lines 51-65). One skilled in the art would have clearly recognized that the method of Siala et al. would have been implemented in software. The implemented software would perform same function of the hardware for less expense, adaptability, and flexibility. Therefore, it would have been obvious to one ordinary skilled in the art at the time of the invention was made to use the software as taught by Langberg et al. in the iterative rake receiver and corresponding reception process in order to reduce cost and improve the adaptability and flexibility of the communication system.

Allowable Subject Matter

11. Claims 5, 6, 7,8, 9, 13, and 14 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

12. The following is a statement of reasons for the indication of allowable subject matter:

The prior art of record, Siala et al. does not teach or suggest each of

the paths L of the multi-path channel i have parameters $(\lambda_i, \tau_i)_{0 \le i < L}$, where λ_i is the average attenuation of path i having the delay τ_i with respect to a first of the paths, and the summer provides a representation of the received signal r for an input signal s represented by the equation:

$r = s\sum_{i=0}^{L-1}|Y_i|^2$ where $|Y_i|^2$ is the squared magnitude of the complex zero mean gaussian random variable produced by the i-th signal simulator, the gaussian random variable having the pre-determined variance μ_i calculated from the eigen values $(\mu_i)_{0 \le i < L}$ of the matrix formed matrix $\left[(\rho_{ij})_{0 \le i, j < L}\right] \cdot Diag\left[(\lambda_i)_{0 \le i, j < L}\right]$, where ρ_{ij} are the L correlation coefficients, and $Diag\left[(\lambda_i)_{0 \le i, j < L}\right]$ is the channel correlation matrix for independent paths.

The prior art of record, Siala et al. also does not teach a channel simulator for representing a radio communications channel in accordance with a markov model.

The prior art of record, Siala et al. also does not teach each of the paths L of the

multi-path channel i have parameters $(\lambda_i, \tau_i)_{0 \le i < L}$, where λ_i is the average attenuation of path i having a delay τ_i with respect to a first of the paths, the summing producing the representation of the received signal r for an input signal s according to the equation:

$r = s\sum_{i=0}^{L-1}|Y_i|^2$ where $|Y_i|^2$ is the squared magnitude of the i-th complex zero mean gaussian random variable, the gaussian random variable having the pre-determined variance μ_i calculated from the eigen values $(\mu_i)_{0 \le i < L}$ of the formed matrix $[(\rho_{ij})_{0 \le i,j < M}] \cdot Diag[(\lambda_i)_{0 \le i,j < L}]$, where ρ_{ij} are the M correlation coefficients, and $Diag[(\lambda_i)_{0 \le i,j < L}]$ is the channel correlation matrix for independent paths.

Conclusion

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kabir A. Timory whose telephone number is (571) 270-1674. The examiner can normally be reached on Mon - Fri 6:30AM - 3:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shuwang Liu can be reached on (571) 272-3036. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR.

Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Kabir A. Timory
September 29, 2007

Shuwang Liu

SHUWANG LIU
SUPERVISORY PATENT EXAMINER